Jiali Wang
Atmospheric Scientist

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Curriculum Vitae
(05-13-2021)

Degrees Attained

- PhD (06/2012), Climate Science, Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, China.
- BS (06/2007), Atmosphere Science, Nanjing University of Information Science and Technology, Nanjing, China

Positions Held

- **Argonne National Laboratory**, **Environmental Science Division** (United States)
  2021-current

  Atmospheric Scientist
- **Argonne National Laboratory**, **Environmental Science Division** (United States)
  2016-current

  Assistant Atmospheric Scientist
- **Argonne National Laboratory, Environmental Science Division** (United States)
  2012-2016

  Postdoctoral Appointee

Honors and Awards

- 2019: Argonne Pacesetter Award
- 2019: HPC Innovation Excellence Award for "Risk and Resiliency of Infrastructure South-eastern USA for AT&T"
- 2019 R&D 100 Finalist for the Climate Risk and Resilience Analysis technology
- 2020: Argonne Director's Award for developing a methodology and analysis of climate impacts to AT&T's infrastructure

Funding

- Role: Co-Investigator – Lead for WRF-Hydro development and simulations and uncertainty quantifications for coupled atmosphere, land, and three-dimensional lake model over Great Lakes Basin

  Project Title: Coastal Observations, Mechanisms, and Predictions Across Systems and Scales – Great Lakes Modeling (COMPASS-GLM)
  Agency: DOE/BER; Lead Laboratory: PNNL
  Status: Ongoing
  Period: 10/1/2020–9/30/2022
  Funding Total: $7.5M; Argonne Portion: $1.25M

- Role: Co-Investigator – Lead for inland flooding and wildfire risk assessment; provide datasets and scientific insights for other tasks such as wind gusts, droughts, and coastal flooding; advised postdocs
  Project Title: AT&T Climate Risk Analysis, Phase 2
  Agency: AT&T Services, Inc. funded to Argonne
  Status: Ongoing
  Period: 12/2020–08/2022
  Funding: $1.25M
- Role: Co-Investigator – Conduct the state-of-the-art Unified Forecasting System model simulations at weekly and seasonal scales and provide data and scientific input to computer scientists for developing domain-expertise-informed, and artificial intelligence/machine learning (AI/ML)-assisted emulators and data assimilation.
  Project tile: AI-Emulator Assisted Data Assimilation (AIEADA)
  Agency: LDRD/Argonne
  Period: 02/2021-01/2024
  Funding: $800,000
- Role: Co-Investigator – Mentor students and provide datasets and scientific guidance for computing indices of wildfire risks using high-resolution and high-quality observation data, as well as numerical model simulations and future projections.

  Project Title: A Risk Assessment and Mitigation Framework for Fire Hazards Caused by Power Delivery Infrastructures
  Agency: LDRD/Argonne
  Status: Ongoing
  Period: 10/2019–09/2021
  Funding: $500,000
- Role: Co-Investigator – Conducted and presented all data analysis related to wildfires over California in historical and future periods using the climate dataset that I developed; mentored graduate student for further analysis; prepared manuscript for peer-reviewed journal.

  Project Title: Climate Variable Projections for Utility Planning
  Agency: PG&E funded to Argonne
  Status: Ended
  Period: 09/2020–02/2021
  Funding: $75,000
- Role: Co-Investigator – Lead researcher conducting WRF ensemble simulations at the highest-ever spatial and temporal resolution over entire contiguous United States and Alaska; quantify uncertainty from two main sources (internal variability and structure uncertainty) of the model for wind data at turbine height.

  Project Title: Tools Assessing Performance
  Agency: DOE/EERE; Lead Laboratory: NREL
  Status: Ongoing
  Period: 10/2018–09/2022
  Funding Total: $8M; Argonne Portion: $1.4M
- Role: Co-Investigator – Senior staff in Thrust 2 to advance characterization and simulation of landslide-scale meteorology and hydrology; co-mentor PhD student for hydroclimatology under extreme weather events.

  Project Title: Defining Precursors of Ground Failure: A Multiscale Framework for Early Landslide Prediction through Geomechanics and Remote Sensing.
  Agency: NSF PREEVENTS funded to Northwestern University

Status: Ongoing
Period: 03/2019–02/2023
Funding Total: $815,695

- Role: Principal Investigator – Worked with computer scientist using AI/ML to downscale precipitation at a much less expensive resource requirement to achieve similar statistical characteristics. A manuscript is currently under review by peer-reviewed journal *Geoscientific Model Development*.

Project Title: Deep Learning to Speed Up High-Resolution Climate Simulations
Agency: LDRD expedition
Status: Ended
Period: 05/2020–09/2020
Funding: $70,000

- Role: Co-Investigator – Lead researcher for conducting inland flooding simulations; provided dataset and guidance for other tasks (e.g., strong wind, coastal flooding).

  Project Title: Climate Change Impacts on AT&T infrastructure, Phase 1
  Agency: AT&T; funded to Argonne
  Status: Ended
  Period: 05/2018–02/2019
  Funding: $325,000

- Role: Co-Investigator – Provided data and knowledge in meteorology to computer scientists in developing deep neural networks for probabilistic forecasting of precipitation and wind.

  Project Title: Probabilistic Forecasting of Extreme Weather Using Deep Learning
  Agency: LDRD Advanced Computing; PI-Carlos Graziani (MCS)
  Status: Ended
  Period: 10/2018/10–09/2020
  Funding: $600,000

- Role: Co-Investigator – Lead researcher in setting up WRF-Hydro model for the first time in standalone and coupling modes at a spatial resolution of 200 m for hydrological components; linked a PC-version calibration tool to HPCs and enabled fast calibration for big calibration problem. A peer-reviewed journal article was published in *Geoscientific Model Development*.

  Project Title: Linking Climate to Water: Implementing a 4-km Regional Climate Model with Hydrologic Model Coupling (WRF-Hydro) Using Argonne's HPC Resources
  Agency: Argonne LDRD
  Status: Ended
  Period: 10/2016–09/2018
  Funding: $550,000

- Role: Principal Investigator – Set up and tested WRF simulation and computational performance at a spatial resolution of 4 km to entirely cover North America on DOE HPCs, including Mira, Theta, Cori, and Bebop.

  Project Title: Generation of a Next-Level Dataset for Regional-Scale Climate Modeling: Convective Resolving Spatial Scales
  Agency: Argonne LDRD Swift
  Status: Ended
  Period: 2018/10–2019/09
  Funding: $75,000

- Role: Co-Investigator – Conducted dynamic downscaling simulations to evaluate model performance and assess future changes in Intensity-Duration-Frequency (IDF) of precipitation.

  Project Title: Linked Rainfall and Runoff Intensity-Duration-Frequency in the Face of Climate Change and Uncertainty.
  Agency: SERDP RC-2514

Status: Ended
Period: 2015–2019
Funding: $800,000

- Role: Principal Investigator – Conducted Energy Exascale Earth System Model (E3SM) simulations using regional refinable mesh to generate high spatial resolutions over regions of interest; explored nudging techniques for improving model performance.

  Project Title: Toward a Limited Area Atmospheric Model Using a Continuously Refinable Mesh
  Agency: Argonne LDRD Innovate
  Status: Ended
  Period: 2016/10–2018/09
  Funding: $420,000

Professional Activities

- Research mentor and co-mentor to 10+ undergraduate and graduate students (majored in earth science, statistics, and computer science); published six peer-reviewed journal articles with the students.
- Reviewer of peer-reviewed journals (e.g., American Meteorological Society, AMS; American Geophysical Union, AGU) in atmosphere and climate science:
  - *Journal of Geophysical Research*: Atmospheres, AGU (impact factor: 3.82)
  - *Earth's Future*, AGU (impact factor: 6.14)
  - *Geophysical Research Letters*, AGU (impact factor: 4.5)
  - *Journal of Applied Meteorology and Climatology*, AMS (impact factor: 2.506)
  - *Journal of Hydrometeorology*, AMS (impact factor: 3.891)
  - *Journal of the American Water Resources Association* (impact factor: 2.472)
  - *Climate Dynamics*, Springer (impact factor: 4.933)
  - *Advances in Atmospheric Sciences*, Springer (impact factor: 2.583)
  - *Water*, MDPI (impact factor: 2.709)
  - *Atmosphere,* MDPI (impact factor: 2.437)
- Topic editor with the journal *Atmosphere*: work with world-class atmospheric scientists and propose research topics and special issues.
- Argonne's Laboratory Computing Resource Center (LCRC) allocations committee member; point of contact for supercomputer allocation applications for atmospheric and climate science.
- Chair of AGU sessions (oral and poster) in 2017 Fall Meeting in New Orleans, Louisiana. Session title: Applications of Machine Learning and Novel Statistical Approaches to the Study of Weather and Climate Using Large Datasets, December 13, 2017.

Publications, Presentations, and Other Evidence of Achievement

White papers:

Feng, Yan, Romit Maulik, **Jiali Wang**, Prasanna Balaprakash, Whitney Huang, Vishwas N Rao, Pengfei Xue, et al."Characterization of Extremes and Compound Impacts: Applications of Machine Learning and Interpretable Neural Networks ." https://doi.org/10.2172/1769686

Wang, Jiali, Rao Kotamarthi, Virendra Ghate, Bethany Lusch, Prasanna Balaprakash, N Justin Wozniak, Xingqiu Yuan, US Department of Energy (DOE) - Office of Science, "A

Hybrid Climate Modeling System Using AI-assisted Process Emulators." Feb 15, 2021https://doi.org/10.2172/1769645.

Referred (peer-reviewed) Journal Articles

Maulik, R., Rao, V., **Wang, J**., Mengaldo, G., Constantinescu, E., Lusch, B., & Kotamarthi, R. (2022). Efficient high-dimensional variational data assimilation with machine-learned reduced-order models. Geoscientific Model Development, 15(8), 3433-3445.

Wang, Jiali, Pengfei Xue, William Pringle, Zhao Yang and Yun Qian. 2022. Impacts of Lake Surface Temperature on the Summer Climate Over the Great Lakes Region. Journal of Geophysical Research (accepted).

Wu, Qiuyi, Julie Bessac, Whitney Huang and **Jiali Wang**. 2022. Station-wise statistical joint assessment of wind speed and direction under future climates across the United States. Advances in Statistical Climatology, Meteorology and Oceanography. http://arxiv.org/abs/2205.02936.

Li, C., Handwerger, A. L., **Wang, J.,** Yu, W., Li, X., Finnegan, N. J., ... & Horton, D. E. (2021). Augmentation and Use of WRF-Hydro to Simulate Overland Flow-and Streamflow-Generated Debris Flow Hazards in Burn Scars. Natural Hazards and Earth System Sciences Discussions, 1-47.

Gamelin, Brandi, Jeremy Feinstein**, Jiali Wang**, Julie Bessac, Eugene Yan and Veerabhadra Kotamarthi. "Projected U.S. Drought Extremes Through the 21st Century with Vapor Pressure Deficit." Scientific Reports (accepted).

Pal, S., **Wang, J**., Feinstein J., Yan E., Kotamarthi, V. R.(2022). Projected Increase in Hydrologic Extremes in the Mid-21st Century for Northeastern United States. Preprint on https://doi.org/10.1002/essoar.10511327.1

Wang, J., Liu, Z., Foster, I., Chang, W., Kettimuthu, R., & Kotamarthi, V. R. (2021). Fast and accurate learned multiresolution dynamical downscaling for precipitation. Geoscientific Model Development, 14(10), 6355-6372. (impact factor: 5.768)

Pringle, W. J., **Wang, J.,** Roberts, K. J., & Kotamarthi, V. R. (2021). Projected Changes to Cool-Season Storm Tides in the 21st Century Along the Northeastern United States Coast. Earth's Future, 9(7), e2020EF001940. (impact factor: 6.14)

Byun, K., Sharma, A., **Wang, J.**, Tank, J. L., & Hamlet, A. F. (2022). Intercomparison of Dynamically and Statistically Downscaled Climate Change Projections over the Midwest and Great Lakes Region. Journal of Hydrometeorology, 23(5), 659-679. (impact factor: 3.891)

Bhatnagar, S., Chang, W., Kim, S., & **Wang, J.** (2022). Computer Model Calibration with Time Series Data Using Deep Learning and Quantile Regression. SIAM/ASA Journal on Uncertainty Quantification, 10(1), 1-26. (impact factor: 3.77)

Schwarzwald, K., A. Poppick, M. Rugenstein, J. Bloch-Johnson, **J. Wang,** D. McInerney, and E.J. Moyer. 2020: Changes in future precipitation mean and variability across scales, *Journal of Climate*, 1-55. (impact factor: 5.707)

Brown, E.K., J. Wang, and Y. Feng. 2020: U.S. wildfire potential: a historical view and future projection using high-resolution climate data. Environmental Research Letters 16 034060. (impact factor: 6.096; citations: 1)

Wang, J., P. Balaprakash, and V.R. Kotamarthi, 2019: Fast domain-aware neural network emulation of a planetary boundary layer parameterization in a numerical weather forecast model, *Geosci. Model Dev*., 12 (10), 4261-4274. (impact factor: 5.768; citations: 7)

Wang, J., C. Wang, V. Rao, A. Orr, E. Yan, and V.R. Kotamarthi. 2019: A parallel workflow implementation for PEST version 13.6 in high-performance computing for WRF-Hydro version 5.0: a case study over the Midwestern United States, *Geosci. Model Dev*., 12, 3523-3539. (impact factor: 5.768; citations: 2)

Ebenstein, R., G. Agrawal, **J. Wang**, J. Boley and R. Kettimuthu. 2018: FDQ: Advance Analytics Over Real Scientific Array Datasets," *2018 IEEE 14th International Conference on e-Science (e-Science)*, 2018, pp. 453-463, doi: 10.1109/eScience.2018.00134.

Zobel, Z., **J. Wang**, D.J. Wuebbles, and V.R. Kotamarthi. 2018: Analyses for High-Resolution Projections through the End of the 21st Century for Precipitation Extremes over the United States. *Earth's Future,* 6, 1471-1490*.* (impact factor: 6.14; citations: 12)

Chang, W., **J. Wang,** J. Marohnic, V.R. Kotamarthi, and E.J. Moyer. 2018: Diagnosing added value of convection-permitting regional models using precipitation event identification and tracking. *Climate Dynamics*. https://doi.org/10.1007/s00382-018-4294-0. (impact factor: 4.933; citations: 7)

Zobel, Z., **J. Wang**, D.J. Wuebbles, and V.R. Kotamarthi. 2017: High Resolution Dynamical Downscaling Ensemble Projections of Future Extreme Temperature Distributions for the United States. *Earth's Future.* 5, 1234-1251. (impact factor: 6.14; citations: 19)

Wang, J., J. Bessac, V.R. Kotamarthi, E. Constantinescu, and B. Drewniak. 2017: Internal variability of a dynamically downscaled climate over North America. *Climate Dynamics*. DOI: 10.1007/s00382-017-3889-1. (impact factor: 4.933; citations: 1)

Zobel, Z., **J. Wang**, D.J. Wuebbles, and V.R. Kotamarthi. 2017: Evaluations of high-resolution dynamically downscaled ensembles over the contiguous United States. *Climate Dynamics*. doi:10.1007/s00382-017-3645-6 (impact factor: 4.933; citations: 18)

Jin, Z., Q. Zhuang, **J. Wang,** S.V. Archontoulis, Z. Zobel, and V.R. Kotamarthi. 2017: The combined and separate impacts of climate extremes on the current and future U.S. rainfed maize and soybean production under elevated CO_2. *Global Change Biology.* 23, 2687-2704, doi: 10.1111/gcb.13617. (impact factor: 9.827; citation: 52)

Cai, H., **J. Wang,** Y. Feng, Q. Wang, Z. Qin, and J. Dunn. 2016: Consideration of Land Use Change-Induced Surface Albedo Effects in Life-Cycle Analysis of Biofuels. Energy and Environmental Science, 9, 2855–2867. (impact factor: 30.289; citation: 19)

Chang, W., M. Stein, **J. Wang**, V.R. Kotamarthi, and E. Moyer. 2016: Changes in Spatio-temporal Precipitation Patterns in Changing Climate Conditions. *Journal of Climate.* 29, 8355–8376. (impact factor: 5.707; citations: 30)

Wang, J., Y. Han, M. Stein, V.R. Kotamarthi, and W.K. Huang. 2016: Evaluation of dynamical downscaled extreme temperature using a spatially aggregated generalized extreme value (GEV) model. *Climate Dynamics*. DOI: 10.1007/s00382-016-3000-3. (impact factor: 4.933; citations: 16)

Wang, J., and V.R. Kotamarthi, 2015: High-resolution dynamically downscaled projections of precipitation in the mid and late 21st century over North America. *Earth's Future,* 3, 268–288. (impact factor: 6.14; citations: 58)

Wang, J., F.N.U. Swati, M.L. Stein, and V.R. Kotamarthi. 2015: Model performance in spatiotemporal patterns of precipitation: New methods for identifying value added by a regional climate model, *Journal of Geophysical Research, Atmospheres*, 120, 1239–1259. (impact factor: 3.82; citations: 27)

Campos, E., and **J. Wang**. 2015: Numerical Simulation and Analysis of the April 2013 Chicago Floods, *Journal of Hydrology*, 531, 454-474. (impact factor: 4.5; citations: 5)

Wang, J., and V.R. Kotamarthi. 2014: Downscaling with a nested regional climate model in near-surface fields over the contiguous United States, *Journal of Geophysical Research, Atmospheres*, 119, 8778–8797. (impact factor: 3.82; citations: 39)

Wang, J., and V.R. Kotamarthi. 2013: Assessment of Dynamical Downscaling in Near-Surface Fields with Different Spectral Nudging Approaches Using the Nested Regional Climate Model (NRCM), *Journal of Applied Meteorology and Climatology,* 52, 1576–1591. (impact factor: 2.506; citations: 23)

Technical Reports:

Kuiper, J., V.R. Kotamarthi, A. Orr, and **J. Wang**. 2017: Geospatial Analysis Tool Kit for Regional Climate Datasets (GATOR): An Open-source Tool to Compute Climate Statistic GIS Layers from Argonne Climate Modeling Results. Web. doi:10.2172/1455010.

Kotamarthi, V.R., **J. Wang**, Z. Zobel, D. Wuebbles, K. Hayhoe, M. Stein, and D. Changnon. 2017: Climate Change Impacts at Department of Defense. Web. doi:10.2172/1376907.

Kotamarthi, V.R., **J. Wang,** B. Drewniak. 2016: Climate Model Datasets for Climate Assessements: A Summary for the State of Maine. Argonne technical report. ANL-16/17. https://publications.anl.gov/anlpubs/2016/10/130646.pdf

Invited by DOE/BER:

Wang, **J.,** Z. Liu, I. Foster, and V.R. Kotamarthi. Fast and accurate learned downscaling for precipitation. March 10, 2021. BER Seminar Series. Zoom online presentation.

Presentations at Major Conferences and Workshops (oral and poster presentations)

Wang, **J.,** Z. Liu, I. Foster, and V.R. Kotamarthi. Precipitation downscaling using conditional super-resolution based deep neural network., 2nd NOAA workshop on AI Session 24, AI/ML for Environmental Data, Image, and Signal Processing, Part 3, Dec 17, 2020

Wang, J., V.R. Kotamarthi, E. Yan. Climate change impact on AT&T's infrastructure: flooding and strong wind over southeastern U.S., 4th International Conference on Regional Climate-CORDEX 2019, Parallel Session C1: High impact regional phenomena. October 14-17, 2019, Beijing, China

Wang, J., V.R. Kotamarthi, and Zach Zobel. Atmospheric Rivers and Precipitation Extremes under a Changing Climate, 99th Annual Meeting, January 6–10, 2019, Phoenix, AZ.

Wang, J. and V.R. Kotamarthi, Convective-permitting simulations and projections over North America: findings and challenges. American Geophysical Union, Fall Meeting 2019, San Francisco, California. Abstract ID: A11Q-2747

Wang, J., P. Balaprakash, V.R. and Kotamarthi, Fast Neural Network Emulation of a Planetary Boundary Layer Parameterization in Weather Research Forecasting Model. American Geophysical Union, Fall Meeting 2018, Washington, D.C. Abstract ID: T31E-0368

Wang, J., E. Yan, X. Ding, A. Jarad, and V.R. Kotamarthi. Understanding the impacts of climate change on hydrological water cycle and water extremes. American Geophysical Union, Fall Meeting 2018, Washington, D.C. Abstract ID: GC33F-1423

Wang, J., W. Chang, Z. Zobel, and V.R. Kotamarthi. Projection of dynamically downscaled precipitation using a newly developed feature-tracking algorithm. American Meteorological Society's 30th Conference on Climate Variability and Change, July 27–29, 2017, Baltimore, Maryland

Wang, J., C. Wang, A. Orr, and V.R. Kotamarthi. A parallel calibration utility for WRF-Hydro on high-performance computers. American Geophysical Union, Fall Meeting 2017, New Orleans, Louisiana. Abstract ID: H41A-1420

Wang, J., W. Chang, V.R. Kotamarthi, J. Marohnic, M. Stein, and E.J. Moyer, Evaluation of rainstorm characteristics in a regional climate model. American Geophysical Union, Fall Meeting 2016, San Francisco, California. Abstract ID: A43G-0324

Wang, J., and V.R. Kotamarthi. Internal variability of a dynamically downscaled future climate over North America. American Geophysical Union, Fall Meeting 2015, San Francisco, California. Abstract ID: A23E-0366

Wang, J., F.N.U. Swati, Y. Han, M. Stein, and V.R. Kotamarthi. Added value by a regional climate model: precipitation and extreme temperature. American Geophysical Union, Fall Meeting 2014, San Francisco, California. Abstract ID: GC33A-0484

Wang, J., Y. Han, V.R. Kotamarthi, and M.L. Stein. Nested Regional Climate Model (NRCM) Downscaling in Extreme Temperature: Evaluated by Generalized Extreme Value (GEV) Distribution. February 2–6, 2014. American Meteorological Society, Atlanta, GA

Wang, J., and V.R. Kotamarthi. Projected changes of extreme precipitation over Contiguous United States with Nested Regional Climate Model (NRCM). American Geophysical Union, Fall Meeting 2013, San Francisco, California. Abstract ID: GC41C-1015